

- ① All stomachs examined: Seven animals from the Shallow Bay area indicated completely empty stomachs. Another seven animals examined by myself and a Fisheries Research Board representative at Kittiganuit all had completely empty stomachs.

Similar findings by B. H. McEwen (July 1954) This report is at the Stoney Office as well as a copy with H. D. Fisher

- ② Hatfield sighted "several" animals displaying noticeable activity on ~~the~~ ~~July 15~~ July 15 Gulls were flying directly overhead.

On July 18 Brodie observed six whales east of Hooper Island (see map no. 2). These animals were quite active, seagulls were flying directly above with many on the sea surface.

3) Gestation last up to 14.5 months with lactation inhibiting conception the following year. The female is capable of conceiving the next year i.e.: 22-23 months lactation plus gestation time = 36 months between births. See Brodie 1971 J.F.R.B. 28 (9) 1309-1318.

④ First flight July 1st estimated a maximum of 1000 beluga in Shallow Bay with animals still coming down the Yukon coast.

On 1 one animal seen in MacKenzie Bay proper (on west side of Pullen Island).

July 3rd Survey during flight to the whaling camp at Shallow Bay indicated 1500 - 2000 whales between Reindeer Channel and Shingle Point. See master map for position of Shallow Bay Herd.

- ⑤ Note: All field work suggested that this herd originated from the west (Alaska). This is substantiated by:
- ① their movement along the only available open water (the Yukon coast past Herschel Island) in the spring (late June).
 - ② the sighting by two biologists (see text) of hundreds near Herschel Island in late July after the bulk of the herd moved out of the Mackenzie Bay area.
 - ③ the sighting by an F.R.B. biologist of about 2000 whales west of Herschel Island on Sept 19-20 1972.
 - ④ None of the hunters from Tuktoyaktuk had seen any whales entering Kugmallit Bay in July from the east; going past their townsides when the ice would have pressed them close to shore and they would have been observed.



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All of this evidence decreases the possibility that the Mackenzie Bay herd originated from the central Arctic.

References cited

BRODIE P.F. 1971 Jan. FRBC 28 (9) 1309-1318

DOAN K.H. & C.W. DOUGLAS 1953 FRBC Bull. 98

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General Behavior.

All white whale populations in Canada migrate to various estuarine systems between mid-June and mid-August. The purpose of the migration is considered to be for calving. Estuaries are warmer, a result of fresh water drainage off the land, plus the shallow depth is conducive to solar heating and mixing. During July the MacKenzie Bay area ranged from 12° to 18°C (53° to 67°F).

The higher water temperature reduces body-heat loss of the 120 to 220 pound newborn calves, thus enabling them to more efficiently utilize milk from their mothers, who in turn expend less energy in their own thermal maintenance.

Both sexes and all ages are represented in the estuaries. The beluga is a social animal exhibiting polygamy, thus there may be a need for maintaining the herd structure even during the calving period.

Field studies indicate that feeding in the estuaries is of minor importance since all ^①stomachs examined were completely empty, both in MacKenzie and Kugmallit Bays. There were ^②two instances where several beluga appeared to be feeding, however these animals were not sampled.

Another advantage of estuarine systems is the shallow water where wave height is reduced and surface breathing made less difficult for the newborn. When stronger winds increase surface chop, the herd will move seaward to ride a larger swell with less surface chop, or as was observed in MacKenzie Bay, move out nearer the ice where the surface is calmer.

Reproduction.

Males are sexually mature at eight years of age however may not be socially mature (take part in the breeding.)

Females mature at five years and bear a single calf on the average of one every three years.

Gestation lasts as long as $14\frac{1}{2}$ months with conception in May and births during July. The MacKenzie Bay population begins calving on arrival during early July.

Lactation lasts as long as two years during which time (3)
the female has again conceived and is carrying a two month old foetus while her calf is being weaned.

Regardless of apparent sexual activity during the calving period, no productive sexual activity is evident in the form of blastocysts or embryos.

Population Size and Dispersion.

The MacKenzie Bay summer population moves along the Yukon coast in open ice leads, arriving in Shallow Bay mid to late June, depending on ice conditions. Due to heavy ice in 1972 the herd did not appear until the end of June. Apparently, two or more groups compose the herd and arrive over a period of several days.

An accurate population estimate is difficult due to the muddy water and the large area over which the herd is dispersed. An aerial survey of the herd in Shallow Bay indicated 1500 to 2000 animals, based on their surface dispersion. A mean estimate of the population is thus 1750 beluga.

Though small groups were seen in the central MacKenzie Bay area during the first half of July (totalling 20-30 individuals) the bulk of the herd fluctuated daily between Reindeer Channel, along the west coast of Shallow Bay, up to Shingle Point.

By mid-July the herd had swung toward central MacKenzie Bay, breaking up into three initial groups: (1) West MacKenzie Bay, (2) Kendall Island and (3) Hendrickson Island. An aerial census of these groups totalled 1670 animals. The Hendrickson Island segment then continues to fluctuate between Hendrickson Island and MacKenzie Bay while the other two groups are well dispersed over MacKenzie Bay. The large area of warm water probably accounts for the

sparse distribution of animals. Smaller estuaries at Seal River (Churchill, Manitoba) and Clearwater Fiord (Baffin Island) necessitate greater concentrations.

Hunting Camps.

The Shallow Bay camp, northwest of Tent Island became active on June 30, the date of the whale herd arrival. The weekend population of people from Aklavik went as high as 45 (about 8 families) with about 15 remaining throughout the week. The weekend hunters are employed in Aklavik while the remainder are either on vacation or are self-employed as trappers.

Kendall Island camp remained vacant during July.

Kittigazuit Island camp contained a population of approximately 24 men, women and children.

The camps are an annual escape from the larger villages and towns during the warm portion of the summer where tenting on a windy point reduces the bother of mosquitoes. The people who are steadily employed arrange their vacations to fit the whaling period while those who cannot, come down for weekends only. The self-employed are generally trappers who have little else to do in this season. Fishing and fish processing is carried on at this time, much of it for human consumption rather than dogfood.

On flying out to visit the camps during the day, the initial appearance to a newcomer is often one of complete lack of activity. One has to realize that native people are well adapted to their surroundings and often take advantage of bright, cooler arctic nights when whaling is more economical on gas, time and ammunition, because of the stable, less windy conditions.

Hunting Methods.

Freighter canoes, speedboats and flatboats are used for hunting with outboard motors ranging 20 to 65 horsepower. There is little cooperation during the actual hunt, the only organization being that all boats go out at one time. This technique causes minimal disturbance to the herd, allowing them to regroup and return to their normal milling area. The number of boats hunting from one camp may number two to eight. Two men crew each boat, one to run the motor, the other to shoot and harpoon.

Because of the extremely muddy water, harpooning the animal before shooting is quite difficult. This method requires skill and patience and few are willing to attempt it. The whale is first wounded by a back shot, no attempt being made to kill it outright as it would immediately sink and be lost. Continual shooting and wounding slows the animal down, either by physical damage or shock, until it can be harpooned and an attached float thrown overboard. The float indicates the direction of swimming by the animal making a lethal shot possible since the area of surfacing can be predicted.

Utilization of Catch.

All skin is removed with full thickness of fat and laid skin-down on the grass for two days. It is then cut into the diamond-shaped chain and hung for two days. After hanging it is boiled, spread out to cool and then temporarily stored in partially buried drums with the fat cuttings from the trimmed sections. The oil which is rendered from the fat preserves the skin.

Whale stomachs are removed, scraped and inflated. After drying to a parchment-like sac, chopped, dried and smoked whale meat, skin and fat are stored inside.

Meat is removed in 30-50 pound pieces, laid out on clean logs and allowed to dry in the air and sun. It is then cut into $\frac{1}{2}$ inch slices and hung on the drying rack. Other meat is cut into $\frac{3}{4}$ inch strips, 2 feet in length and dried. After drying, it is smoked for several days, then either stored dry or in oil.

Fat is used for storage of meat, skin or berries. Half the fat is cut transversely from the large sections of skin, sliced into smaller pieces to aid the natural rendering process.

Reaction to New Sound Sources.

In general the white whale will move to a safe distance when confronted with a new sound source. Depending on sound intensity, this may extend several miles.

The depth of water and coastal topography is important here, i.e: if the sound is in the vicinity of the only means of escape such as the mouth of a shallow bay inhabited by the whales, the reaction will be more panicked and the whales will immediately stream out of the area and out to sea.

If there are many escape possibilities, i.e: the sound source at the head of a bay with the whales seaward of the source, or if the source is in open sea, the reaction is less violent and some animals may display cautioned curiosity once assured of ready escape.

^C
One_h assured that the source is stationary and not associated with danger such as hunting boats, the situation becomes one of casual milling about the area, but again at a safe distance. This reaction was displayed in the vicinity of the island building near Pelly Island in July '72. The bulk of the Kendall Island segment of the herd remained 5-6 miles south of the dredge site while there were occasional separated sightings closer to the site (within $\frac{1}{2}$ mile) on the seaward side. The distances from the construction site seem relative to their ease of escape.

Possibility of Physical Damage to White Whales by Seismic Explosions.

The initial caution (avoidance) displayed by white whales of new sound sources would place them well away from the seismic site (the noise of the approaching ship alone) and once explosives, air guns or any high energy, low frequency were used, they would move well away from the area.

As a result of their initial caution, the chance ^{of} ~~that~~ an animal being close enough to suffer physical damage would be remote. This is based on personal experience in many attempts to herd white whales en masse.

Considering the soft mud bottom of much of MacKenzie Bay, the shallow depth and the load of suspended particulate matter, plus choppy surface; the dissipation of acoustical energy must be maximal in comparison to other areas. Marine mammals exhibit remarkable hearing thus any acoustical monitoring systems would yield little useful information and in the final analysis be subjective as to whether it was at a level of disturbance to white whales. Their observed reaction would provide the only tangible evidence of acoustical tolerance.

Response to Hunting.

Native peoples will hunt whales for short periods each day. In this manner, the herd which moves out of the area entirely, or disperses during the hunt, will regroup and return. Continued hunting results in a highly dispersed and wary herd, resulting in longer, less productive and more expensive hunting forays. Excessive harassment can cause a herd of whales to leave the hunting area earlier than in other years. Early departure could result in increased calf mortality by colder water and wave heights.

White whales are present in considerable numbers around the dock area of Churchill, Manitoba, despite the noise of ship loading and repairs. White whale were rare in the Churchill vicinity in 1930 and 1931 (Doan and Douglas, 1953) FRB Bull #98 however, did return. This behaviour is attributed to increased hunting activity prior to 1930.

The fact that the whale herd continued to oscillate between Hendrickson Island via Pullen Island to Kendall Island while the dredge was in operation indicates that the noise did not represent any real danger. This herd movement back and forth past Pullen Island is typical of this population and not unique to the year of offshore activities.

The Aklavic hunters camped in the Shallow Bay area mentioned that ("two years ago") in 1970, there was a ship near that coast carrying out seismic work. They said that the herd bypassed the Shallow Bay area and continued on to the Kendall Island, Hendrickson Island sites because of this

disturbance. Such a cautious reaction by a white whale herd containing many females about to calve is not unusual.

Hunting Impact on the Mackenzie Bay Whale Herd.

As all animals are fully utilized, mostly for human consumption, hunting effort is concentrated on larger animals, yielding more skin, meat and oil for the hunting effort. The result is that mostly mature males are captured, males being significantly larger to the degree that they can be distinguished during the hunt. Most females can be distinguished by association with newborn and older calves. Of 23 whales known to be taken in Shallow Bay, one was female. She was sexually mature but not lactating thus, if she did have a calf, it would be of an independent age. Of 15 known to be taken at Kittigazuit, 2 were female, both sexually mature and lactating, but from reproductive tract examination of one of these, its calf was at least one year old. This was to the end of July.

Whaling is expensive both in gasoline and ammunition (never in great supply at a camp) thus is not done purely for the thrill of the hunt. Since the women are responsible for most of the multi-stage processing of the whale they set the limits for daily catches. With too many whales there is rushed and poorer processing. Though several boats may go out to hunt, one or two may pursue but not shoot any animals and help tow the catch of others to the camp. This eliminates considerable wastage of animals.

The hunting impact on the herd must be based on personal, past experience. Though there are hunters of varying skill involved, it is estimated that for every animal

captured, there is an equal number of escaping wounded. The reason for the large number of wounded is that at the beginning of the hunt, many whales are present, moving in groups of 2 and 3. As they surface, attempts are made to wound them, firing at several whales. Once an animal appears to falter as a result of a rifle hit, it is pursued and the others left to escape or be chased by a following boat. Considering that the sex ratio of the catch is 12:1, male to female, most of the escaping animals are mature males.

The mortality rate of the escaping wounded can only be estimated, but 50% would be conservative since there are additional problems in MacKenzie Bay, i.e: (1) Wounding mortality would be higher here than in Cumberland Sound (Baffin I.) since the MacKenzie Bay hunters invariably use large calibre, heavier bullets as compared to the higher ratio of lighter faster bullets used in Cumberland Sound. The lighter bullets cause more superficial wounds. (2) The lack of salt water as an antiseptic for open wounds. The bay can be considered as completely fresh water. (3) The greater effort in breathing as a result of the low salinity and negative buoyancy of the animal.

Thus, the actual kill of white whales would more likely be the known landed catch X 1.5.

The Shallow Bay catch would be approximately 30 whales for 1972 since there were 2 other smaller whaling camps in the vicinity. The Shallow Bay "kill" would be 30 X 1.5 or

45 animals. Three dead whales were reported drifted ashore and one personally sighted (and photographed) at sea.

As of the end of July, no animals were hunted from Kendall Island. The Kugmallit Bay catch was 15 known at Kittigazuit and less intensive hunting by people stationed at Tuktoyaktuk estimated 10 to that date. The catch in that area may have exceeded 35-40 by the end of the season thus the actual kill would be about 55.

Total kill in Mackenzie Bay is estimated at $55+45=100$ animals or less than 6% of the total herd for 1972.

The most important factor here is that there is a considerable bias toward males thus there is less impact on production of calves. White whales are considered polygamous, thus the taking of males to this extent should have the least impact on herd production.

Recommendations.

(1) The local people be informed well in advance of any activity which in any way will effect them. Most conflict in my experience from other areas, has arisen when the local people were told "too little, too late" and had no recourse but to refuse cooperation either because they were insulted by the inconsideration or until they had assessed the situation themselves.

(2) There are many local people in the Mackenzie Bay area who would advise on such problems as disturbance of marine mammals by oil exploration activities. This could be done in a casual manner or as a hired consultant. Mr. Jacob Archie (Erigaktuk) or Mr. Dan Gordon, both of Aklavik impress me as being knowledgeable and objective people.

(3) With respect to island construction, concentration of equipment would present less of an acoustical barrier. Example: immediately before the island building, all floating equipment was spread over several miles. There was considerable traffic (jet boat especially) between these sites. This array of craft and associated activity could have presented an acoustical barrier but because of the late ice there was already a physical blockage of the passage to Kugmallit Bay. This possible acoustical barrier was not tested by the whales.

On construction of the island all equipment was concentrated in the immediate vicinity of the site and the

traffic restricted to within this area. This appeared to be a better situation giving the whale herd a large, untrafficked area, save the 5-6 mile inshore avoidance of the island site.

Alternate areas or passages must be provided when there is any similar activity.

(4) Seismic work offshore must be flexible enough to avoid areas of Mackenzie and Kugmallit Bay when whales are present. Timing should be such that studies be conducted in areas alternating with whale movements. Any work conducted before the usual time whales enter that area must be timed so as to be completed before the whales approach. The least harassment would result if seismic work were conducted after whales had passed through that area.

(5) Employees should be discouraged from hiring local people to take them out on whale hunts, especially if catch requirements have already been met. At best, any hiring of local people to guide in the whale area should be of observation only and not hunting.

